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Effect of Season, Sex, and Age on Prevalence of Parasitism in Dogs from Southeastern Wisconsin

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ABSTRACT: Examination of fecal samples from 309 animal shelter dogs in Milwaukee County, Wisconsin, was made to evaluate the effect of season, host age, sex, and care status on the prevalence of single and multiple infections of intestinal parasites. One or more species of parasite were identified in 42% of fecal samples. Intestinal parasites were present in all months of the year, but prevalence was higher in warmer than in colder seasons. *Toxocara canis* was the most common parasite egg recovered (21.4%). Other helminth eggs recovered were *Ancylostoma* sp. (11.3%), *Trichuris vulpis* (8.7%), and *Toxascaris leonina* (4.2%). The protozoans *Isospora canis* (5.2%) and *Giardia lamblia* (4.5%) also were recovered. No cestode eggs were seen during the study. There was no significant difference in overall prevalence between 168 male (41.7%) and 141 female (41.9%) dogs. Ascarids were more common in younger dogs. Hookworm prevalence also decreased with increasing host age. Male dogs were more frequently infected with hookworms. Whipworms were found less often in very young and in older dogs. Multiple infections comprised 27% of positive fecal samples but were not clustered by season. Neutered animals of both sexes were infected less often than were intact animals. Stray animals were significantly more frequently infected than were previously owned dogs.

KEY WORDS: dog, canine, helminth, protozoa, *Toxocara canis, Toxascaris leonina, Trichuris vulpis, Ancylostoma* sp., hookworm, *Isospora canis,* coccidia, *Giardia lamblia,* Milwaukee, Wisconsin.

Zoonotic disease transmitted by dogs is an important aspect of public health. Increasing pressure for use of available land coupled with an increasing canine population makes this problem particularly important in urban areas. Environmental contamination with the infective eggs and larvae of dog parasites may pose a significant risk to humans. The dog population in the U.S.A. is estimated to be >55 million (Schantz, 1991). Dubin et al. (1975) found one-third of soil samples from public parks to be contaminated with nematode eggs. A significant body of literature exists on visceral larva migrans and its causative agent *Toxocara canis* Werner, 1782 (Glickman et al., 1979). Hookworms may cause cutaneous larva migrans in humans who come in contact with the eggs shed in dog feces (Schad, 1994). Both types of parasites may have high prevalence rates in dogs because of transplacental or transmammary transmission (Soulsby, 1969; Schad, 1994).

Numerous surveys of canine intestinal parasites have been reported (Wright, 1930; Vaughn and Murphy, 1962; Worley, 1964; Jaskoski, 1970; Schantz et al., 1977; Palmieri et al., 1978; Stewart et al., 1986; Jordan et al., 1993). However, few studies have included an examination of the effects of dog sex or age on the prevalence of intestinal parasites (Visco et al., 1977; Kazacos, 1978; Hoskins et al., 1982; Blagburn et al., 1996). No data exist on seasonality of canine infections or prevalence of single or multiple infections in Wisconsin.

The present study was undertaken to evaluate the effect of seasonality, host age, host sex, and care status (stray animal or unwanted pet) on the prevalence of single and multiple infections of intestinal parasites in dogs collected in Milwaukee County, Wisconsin.

Materials and Methods

From November 1994 to October 1995, 309 fecal samples taken from dogs housed at the Wisconsin Humane Society (WHS) shelter were examined for the presence of intestinal parasites. Dogs to be included in this study were selected by WHS personnel and were divided evenly by sex into 6 age groups, ranging from <3 mo to >60 mo of age. Shelter records indicated whether the dogs were stray animals or unwanted pets (care status). Fecal samples were collected from fresh scats or directly from the rectum, stored in capped Styrofoam cups, and refrigerated until transported to the laboratory. Samples were always examined within 24 hr of collection.

Approximately 3 g of feces was placed in a 15-ml centrifuge tube and washed once in tap water. Flotation was performed using zinc sulfate (specific gravity = 1.18) or Sheather's sugar solution. Tubes were centrifuged at 1,500 rpm for 5 min. The liquid on the attached coverslips was examined microscopically for the presence of helminth eggs and protozoan cysts. Because better results were obtained using zinc sulfate,

Table 1. Monthly parasite prevalence and number of multiple infections in fecal samples from dogs from southeastern Wisconsin.

Month	No. dogs examined	No. dogs infected	Prevalence (%)	No. dogs with multiple infections: 1 species	2 species	3 species
Jan	22	6	27.3	5	1	0
Feb	25	9	36.0	7	2	0
Mar	26	15	57.7	11	2	2
Apr	24	9	37.5	9	0	0
May	26	10	38.5	8	1	1
Jun	27	10	37.0	10	0	0
Jul	26	12	46.2	9	2	1
Aug	25	11	44.0	9	2	0
Sep	28	13	46.4	9	3	1
Oct	29	17	58.6	8	7	2
Nov	25	8	32.0	4	4	0
Dec	26	9	34.6	5	4	0
Total	309	129	41.8	94	28	7

sugar flotation was discontinued after 2 monthly sampling periods. Statistical analysis was conducted using the chi-square test for goodness of fit (Sokal and Rohlf, 1973).

Results and Discussion

A total of 129 (41.8%) of the 309 fecal samples examined were positive for intestinal parasites. Monthly prevalence values ranged from a low of 27.3% (6/22) in January to a high of 58.6% (17/29) in October (Table 1). Seasonal prevalence trends were not distinct, but infection rates were higher during warmer months and lower in winter. Prevalence in July through October were all >44%, whereas infections in November though February never exceeded 36%.

The most common parasite egg identified from fecal samples was that of the ascarid *Toxocara canis,* found in 66 (21.4%) of the 309 fecal samples examined (Table 2). A wide range of prevalence values have been reported for this parasite from shelter dogs in the U.S.A. Smith and Seaton (1981) found an ascarid prevalence of 30% from dogs in Texas, and Palmeri et al. (1978) reported *T. canis* in 49% of their samples from Utah. Marron and Schroeder (1978) described ascarids in 49% of "younger dogs" in California. In Indiana, Kazacos (1978) reported that 18.3% of examined dogs were infected with *T. canis.* However, Hoskins et al. (1982) found this parasite in only 8.5% of dog fecal samples examined in Louisiana. Blagburn et al. (1996) reported *T. canis* in 14.54% of fecal samples nationally and in 15.80% of samples from the Midwest.

Table 2. Prevalence of intestinal parasites in fecal samples from dogs from southeastern Wisconsin.

Parasite	No. dogs infected	Prevalence (%)
Nematoda		
Ascarids		
Toxocara canis	66	21.4
Toxascaris leonina	13	4.2
Anclyostoma sp.	35	11.3
Trichuris vulpus	27	8.7
Protozoa		
Isospora canis	16	5.2
Giardia lamblia	14	4.5

Very young dogs were more frequently infected with ascarids (Table 3). This finding was expected because this parasite has a transplacental route of infection (Glickman et al., 1979). Prevalence of ascarids decreased with increasing age of male dogs, from 54.5% in males 0–3 mo to 3.8% in males >60 mo of age. Females were also most frequently infected at a very young age (52.2% at 0–3 mo), and prevalence also decreased with increasing age. The least common helminth egg recovered from this study was that of *Toxascaris leonina* von Linstow, 1902, recovered from only 13 (4.2%) samples. Because this helminth constituted such a small percentage of the total parasite burden, it was combined with *Toxocara canis* in subsequent tables (Tables 3, 4). However, the low level of *Toxascaris leonina* in total parasite burden is consistent with most previous reports. The prevalence of *T. leonina* reported in our study (4.2%) is markedly higher that the *T. leonina* prevalence (0.46%) reported by Blagburn et al. (1996) for the Midwest but lower than that reported by Kazacos (1978), who employed a necropsy procedure rather than fecal flotation.

Hookworm, identified as *Ancylostoma* spp. Dubini, 1843, based on egg size (Georgi and McCulloch, 1989), was the second most common type of parasite egg detected, found in 35 (11.3%) samples. *Ancylostoma* may have a transmammary infection route (Lindsay and Blagburn, 1995), accounting for the higher prevalence in very young dogs. Exclusive of the high prevalence in very young dogs, hookworm prevalence appeared to be independent of host age (Table 3). Prevalence in males ranged from 10%

Table 3. Effect of sex and age on number and prevalence of intestinal parasites in fecal samples from dogs from southeastern Wisconsin.

Infection category	Dog age (mo) 0–3	3–6	6–12	12–36	36–60	60+	Total
Male dogs							
Ascarids	12 (54.5)*	10 (33.3)	3 (15.0)	9 (18.4)	4 (19.1)	1 (3.8)	39 (23.2)
Hookworms	5 (22.7)	3 (10.0)	5 (25.0)	5 (10.2)	3 (14.3)	4 (15.4)	25 (14.9)
Whipworms	0	3 (10.0)	2 (10.0)	8 (16.3)	0	0	13 (7.7)
Coccidia	3 (13.6)	0	1 (5.0)	1 (2.0)	1 (4.8)	0	6 (3.6)
Giardia	2 (9.1)	2 (6.7)	0	0	0	0	4 (2.4)
Uninfected	5 (22.7)	18 (60.0)	10 (50.0)	28 (57.1)	15 (71.4)	22 (84.6)	98 (58.3)
Total	22	30	20	49	21	26	168
Female dogs							
Ascarids	12 (52.2)	4 (25.0)	8 (40.0)	8 (3.8)	2 (22.2)	2 (13.3)	36 (25.5)
Hookworms	2 (8.7)	1 (6.3)	1 (5.0)	5 (8.6)	0	1 (6.7)	10 (7.1)
Whipworms	0	1 (6.3)	6 (30.0)	6 (10.3)	0	1 (6.7)	14 (9.9)
Coccidia	3 (13.0)	2 (12.5)	1 (5.0)	4 (6.9)	0	0	10 (7.1)
Giardia	3 (13.0)	1 (6.3)	0	5 (8.6)	0	1 (6.7)	10 (7.1)
Uninfected	8 (34.8)	9 (56.3)	9 (45.0)	37 (63.8)	7 (77.8)	12 (73.3)	82 (58.2)
Total	23	16	20	58	9	15	141

* No. (%) of dogs in each category.

in younger to 15% in dogs >60 mo of age. Prevalence in females was lower than that in males but also appeared independent of age, exclusive of the 0–3 mo age class. Hookworms are the most common type of canine parasite in most reports. Visco et al. (1977) reported hookworms in 35.8% of their samples from Missouri, Hoskins et al. (1982) found 38.5% of dogs in Louisiana harboring hookworm eggs, and Blagburn

Table 4. Number and prevalence of single and multiple infections of intestinal parasites in dogs from southeastern Wisconsin.

Parasite	No. dogs infected	Prevalence (%)
Ascarid	46	14.2
Hookworm	20	6.5
Whipworm	18	5.8
Coccidia	7	2.3
Giardia	5	1.6
Ascarid + hookworm	8	2.6
Ascarid + whipworm	6	1.9
Ascarid + coccidia	5	1.6
Ascarid + *Giardia*	5	1.6
Hookworm + whipworm	1	0.3
Hookworm + *Giardia*	2	0.6
Coccidia + *Giardia*	1	0.3
Ascarid + hookworm + whipworm	2	0.6
Ascarid + hookworm + coccidia	2	0.6
Ascarid + coccidia + *Giardia*	1	0.3

et al. (1996) reported *A. caninium* present in 20.66% of fecal samples in the Midwest and in 19.19% of samples nationally. Reasons for the almost 2-fold difference in prevalence between Blagburn et al.'s (1996) and our findings are unclear. Their Midwest results were based on a pooled sample from several cities, whereas our study was conducted only in metropolitan Milwaukee, a mostly urban area. Their samples were collected at only 1 time of year. In Milwaukee, those samples were collected on only 1 day of the year (Castelein, pers. comm.). Low sample size, a necessity in such a comprehensive national survey, cannot be ruled out as an additional contributing factor.

Hookworm eggs and free-living larvae are sensitive to environmental conditions (Schad, 1994). The lower prevalence in the present study may reflect climatic differences between Wisconsin and the warmer areas surveyed in several previous studies. Seah et al. (1975) found a hookworm prevalence of only 12.5% in stray dogs from Montreal, Canada, data more consistent with our findings. Cold winters probably contribute to low egg viability in scats and low survival of free-living larvae. Even though fewer dogs passed hookworm eggs during winter, at least one hookworm-infected dog was present in each monthly sample. Very young and the oldest males had similar rates of infection. Almost

twice as many males as females were infected with hookworms (14.9% vs. 7.1%). Females displayed a prevalence pattern similar to that in males but at lower levels; hookworms were absent in females 36–60 mo of age and increased to 8.6% in females 12–36 mo of age (Table 3).

Eggs of the whipworm *Trichuris vulpis* Froelich, 1789, were found in 27 (8.7%) samples. Whipworm eggs were absent in very young (0–3 mo) dogs and were absent or found in low prevalence in most age groups (Table 3). The highest prevalence of whipworm found in this study was in females 6–12 mo old (30%). Whipworms were found in 15% (Hoskins et al., 1982) and 27% (Smith and Seaton, 1981) of hosts by other workers. Both of these previous studies were conducted in areas with warmer climates than Wisconsin. Working in Canada, Seah et al. (1975) reported whipworms in only 4.6% of their samples. Thus, weather may play a role in egg survival for this parasite. However, Blagburn et al. (1996) reported whipworms in 14.29% of fecal samples nationally and in 16.39% of samples in the Midwest. These workers further stated that dogs in the Midwest are at increased risk of whipworm infection. Based on a much lower whipworm prevalence in our study (8.7%), our results do not support this conclusion for the southeastern Wisconsin area.

Two types of protozoan cysts were identified during this study. Coccidia oocysts, identified as *Isospora canis* Nemeseri, 1959, and *Giardia lamblia* Kofoid and Christiansen, 1915, were found in 16 (5.2%) and 14 (4.5%) samples, respectively (Table 2). Coccidia infections were more common in younger dogs and decreased with host age (Table 3). Females were consistently more frequently infected with this protozoan. The prevalence of coccidia oocysts in our study was similar to results of prior studies (Streitel and Dubey, 1976; Jordan et al., 1993; Blagburn et al., 1996), although Hoskins et al. (1982) found coccidia in only 1.1% of their samples. Few prior surveys have reported *Giardia* infections (Hoskins et al., 1982; Jordan et al., 1993; Blagburn et al., 1996). *Giardia lamblia* was found more frequently in females and in younger dogs. Hoskins et al. (1982) found *Giardia* in only 0.8% of their samples and found that *Giardia* was more common in younger dogs, but there did not appear to be a sex difference in this infection. Blagburn et al. (1996) found *Giardia* in <1% of dogs nationally and in the Midwest. However, these workers believed that they greatly underestimated the actual prevalence of *Giardia* in the canine population because of their choice of flotation medium. Our results, using zinc sulfate, support their conclusion. Canine giardiasis was reviewed recently by Barr and Bowman (1994).

No tapeworm eggs were identified during the present study, which was not surprising considering the nature of our egg recovery procedure. Eggs of tapeworms that are common in dogs are not readily identified by zinc sulfate flotation. Scats of all dogs collected for this study were examined visually for the presence of proglottids, but none were observed.

Multiple infections were found in 35 (27%) of 129 positive fecal samples, comprising 11.3% of the total 309 samples examined (Table 1). Multiple infections were not clustered by month or season but were found in small numbers throughout the year and were absent only in April and June. The highest number of double infections were recorded in October, also the month of highest overall prevalence. In October, the occurrence of double infections (7) almost equaled that of single infections (8). Throughout this study, only 7 samples containing 3 different parasites were found; they were detected in 5 different monthly collections and were scattered throughout the year. No more than 3 parasites were found in any fecal sample examined. The frequency of multiple infections appears consistent with results of most previous studies utilizing fecal flotation techniques (Hoskins et al., 1982; Blagburn et al., 1994) but lower than results of previous studies utilizing necropsy (Kazacos, 1978).

Ascarids were a component of most multiple infections. Four dogs were concurrently infected with both ascarid species. Thus, the number shown in Table 2 (79) is higher than numbers in Tables 3 and 4, where the 2 ascarids are combined. Ascarids were found in combination with every other parasite recovered in this study (Table 4). Only 3 multiple infection combinations occurred that did not involve ascarids. Hookworm eggs, the second most common parasite found in the present study, also were found in combination with every other type of intestinal parasite. Infections involving 3 different parasite species were found in only 3 fecal samples. Ascarids always accounted for 1 of the 3; hookworm occurred in 2 of the 3.

Of 309 fecal samples examined, 168 (54.4%) were from male dogs. Of these males, 70 (41.7%) harbored 1 or more intestinal parasites (Table 3). Eighteen (10.7%) of the male dogs were neutered. All but 1 male dog were >6 mo old. The neutered males were a mix of unwanted (10) and stray (8) dogs. Five neutered males were each infected with a single species of intestinal parasite. No multiple infections were observed in this group. All parasites recovered in the study were represented in this group of neutered males except the coccidian. Prevalence of infection among neutered males was significantly less (28%) than the 42% prevalence among intact males ($\chi^2 = 6.48$, df = 1, $P < 0.05$).

Fifty-nine (41.9%) of the 141 fecal samples from female dogs were positive for intestinal parasites. There was no significant difference in overall prevalence between males and females ($\chi^2 = 2.42$, df = 1, $P > 0.05$). Five fecal samples were from spayed females. Four of these females were 12–36 mo of age, and the fifth was >60 mo of age. None of the 5 spayed females were infected. All of the spayed females were identified as unwanted pets; none were strays. The sample of spayed females is too low to draw definitive conclusions, but other workers have speculated that spayed females tend not to roam as much and may receive better care (Visco et al., 1977). The results of the present study appear to be consistent with those of previous reports (Hoskins et al., 1982; Blagburn et al., 1996).

Regarding the issue of care status, dogs classified as stray animals accounted for 179 (58%) of the 309 total fecal samples; 101 (56%) were infected with 1 or more intestinal parasites. One hundred thirty (42%) fecal samples were from animals classified as unwanted pets; 49 (38%) of these animals were infected. This difference in prevalence between unwanted and stray animals was highly significant ($\chi^2 = 9.47$, df = 1, $P < 0.01$), probably reflecting a difference in care level, including frequency of veterinary care, use of anthelminthics, and the degree to which the animal roams and comes in contact with infective stages of parasites.

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Literature Cited

Barr, S. C., and D. D. Bowman. 1994. Giardiasis in dogs and cats. Compendium on Continuing Education for the Practicing Veterinarian 16:603–609.

Blagburn, B. L., D. S. Lindsay, J. L. Vaughan, N. S. Rippey, J. C. Wright, R. C. Lynn, W. J. Kelch, G. C. Ritchie, and D. I. Hepler. 1996. Prevalence of canine parasites based on fecal flotation. Compendium on Continuing Education for the Practicing Veterinarian 18:483–509.

Dubin, S., S. Segall, and J. Martendale. 1975. Contamination of soil in two city parks with canine nematode ova including *Toxocara canis:* a preliminary study. American Journal of Public Health 65:1242–1245.

Georgi, J. R., and C. E. McCulloch. 1989. Diagnostic morphometry: identification of helminth eggs by discriminant analysis of morphometric data. Proceedings of the Helminthological Society of Washington 56:44–57.

Glickman, L. T., P. M. Schantz, and R. H. Cypess. 1979. Canine and human toxocariasis: review of transmission, pathogenesis, and clinical disease. Journal of the American Veterinary Medical Association 175:1265–1269.

Hoskins, J. D., J. B. Malone, and P. H. Smith. 1982. Prevalence of parasitism diagnosed by fecal examination in Louisiana dogs. American Journal of Veterinary Research 43:1106–1109.

Jaskoski, B. J. 1970. Endoparasites of well-cared-for dogs. Journal of Parasitology 56:431.

Jordan, H. E., S. T. Mullins, and M. E. Stebbins. 1993. Endoparasitism in dogs: 21,583 cases (1981–1990). Journal of the American Veterinary Medical Association 203:547–549.

Kazacos, K. R. 1978. Gastrointestinal helminths in dogs from a humane shelter in Indiana. Journal of the American Veterinary Medical Association 173:995–997.

Lindsay, D. S., and B. L. Blagburn. 1995. Practical treatment and control of infections caused by canine gastrointestinal parasites. Veterinary Medicine 90:441–443.

Marron, J. A., and R. J. Schroeder. 1978. Survey of *Toxocara canis* infection rate in impounded dogs in Los Angeles County. Journal of the American Veterinary Medical Association 172:713.

Palmieri, J. R., J. B. Thurman, and F. L. Andersen. 1978. Helminth parasites of dogs in Utah. Journal of Parasitology 64:1149–1150.

Schad, G. A. 1994. Hookworms: pets to humans. Annals of Internal Medicine 120:434–443.

Schantz, P. M. 1991. Parasitic zoonoses in perspective. International Journal for Parasitology 21: 161–170.

Schantz, P. M., C. Van Alstine, and A. Blacksheep, Jr. 1977. Prevalence of *Echinococcus granulosus* and other cestodes in dogs on the Navajo Reservation in Arizona and New Mexico. American Journal of Veterinary Research 38:669–670.

Seah, S. K. K., G. Hucal, and C. Law. 1975. Dogs and intestinal parasites: a public health problem. Canadian Medical Journal 112:1191–1194.

Smith, J. P., and A. Seaton. 1981. Helminth infections of dogs in central Texas. Veterinary Medicine, Small Animal Clinician 76:1627–1629.

Sokal, R. R., and F. J. Rohlf. 1973. Introduction to Biostatistics. W. H. Freeman, San Francisco. 368 pp.

Soulsby, E. J. L. 1969. Helminths, Arthropods and Protozoa of Domesticated Animals, 6th ed. Williams and Wilkins, Baltimore, Maryland. 824 pp.

Stewart, G. L., M. Shebani, J. Crutchfield, K. Raines, B. Wood, and M. Kilgore. 1986. Ova of canine intestinal helminth parasites in fecal samples recovered from suburban parks. Southwestern Veterinarian 37:37–39.

Streitel, R. H., and J. P. Dubey. 1976. Prevalence of *Sarcocystis* infection and other intestinal parasitisms in dogs from a humane shelter in Ohio. Journal of the American Veterinary Medicine Society 168:423–424.

Vaughn, J. B., Jr., and W. S. Murphy. 1962. Intestinal nematodes in pound dogs. Journal of the American Veterinary Medical Association 141: 484–485.

Visco, R. J., R. M. Corwin, and L. A. Selby. 1977. Effect of age and sex on the prevalence of intestinal parasitism in dogs. Journal of the American Veterinary Medical Association 170:835–837.

Worley, D. E. 1964. Helminth parasites of dogs in southeastern Michigan. Journal of the American Veterinary Medical Association 144:42–46.

Wright, W. H. 1930. The incidence of internal parasites in dogs at Washington, DC. Journal of the American Veterinary Medical Association 76: 794–803.

New Editor

My five-year term as editor of the *Journal* comes to a close with volume 65. I appreciate the opportunity to serve in this capacity for the Society, for I believe that it was a positive experience. I would also like to thank the members of the Editorial Board, the staff at Allen Press, and most of all, the authors who were kind enough to work with me bringing their research output to the *Journal*. I feel that thorough the efforts of all involved, the *Journal* has maintained the high standards and quality set by my predecessors.

The new editor is Dr. Willis A. Reid, Jr. Starting immediately, all manuscripts and correspondence concerning the *Journal* are to be sent to him at 6210 Hollins Drive, Bethesda, MD 20817. His e-mail address is: jwrassoc@erols.com.

Sherman S. Hendrix
Editor

Editor's Acknowledgment

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